The invention claimed is:

1. An optical fiber amplifier system, comprising:

an optical fiber adapted for use as an optical waveguide amplifier;

at least one optical pump optically coupled to the optical fiber, the pump receiving both a DC electrical input and an AC electrical input, and providing an optical pump power to the optical fiber having both a DC optical power component and an AC optical power component;

an optical pump power detector optically coupled to the pump; and

at least one controller coupled to the pump power detector to determine the DC optical power component of the optical pump power, for adjusting the DC electrical input to the pump based on the DC optical power component.

2. The amplifier system of claim 1, wherein the optical fiber is an optical signal transmission fiber.

3. The amplifier system of claim 1, wherein the optical fiber is a dispersion compensating fiber.

4. The amplifier system of claim 1, wherein the optical fiber is a Raman optical waveguide fiber.

5. The amplifier system of claim 1, wherein the controller includes a comparing circuit that determines the DC optical power component of the optical power pump by comparing an

electrical pump signal that is proportional to the optical pump power to the square of that electrical pump signal.

6. The amplifier system of claim 5, wherein the comparing circuit includes a first mixer electrically coupled to the pump power detector, a squaring circuit electrically coupled to the pump power detector, a second mixer electrically coupled to the squaring circuit, and a local oscillator electrically coupled to the first mixer and to the second mixer, wherein the oscillator provides input signals to the first and second mixer having the same frequency of modulation as the AC input to the pump.

7. The amplifier system of claim 6, wherein the frequency of modulation of the oscillator is equal to or greater than 10 kHz.

8. The amplifier system of claim 7, wherein the frequency of modulation of the oscillator is within the range of from about 100 kHz to about 200 kHz.

9. The amplifier system of claim 6, wherein the comparing circuit includes a first amplitude detection circuit electrically coupled to the first mixer, and a second amplitude detection circuit electrically coupled to the second mixer.

10. The amplifier system of claim 9, wherein the comparing circuit includes a divider electrically coupled to the first and second amplitude detection circuits, and wherein the divider determines an electrical signal equivalent of the DC component of the optical pump power.

11. The amplifier system of claim 10, wherein the pump power detector includes a photodiode, which converts the optical pump power into the electrical pump signal.

12. The amplifier system of claim 11, wherein the comparing circuit includes a trans-impedance amplifier optically coupled to the first mixer and the squaring circuit, and wherein the trans-impedance amplifier amplifies the electrical pump power.

13. The amplifier system of claim 12, wherein the comparing circuit includes a third amplitude detector circuit electrically coupled to the pump power detector, and a subtractor electrically coupled to the second and third amplitude detection circuit.

14. The amplifier system of claim 1, wherein the at least one pump includes a first pump and a second pump.

15. The amplifier system of claim 14, wherein the optical pump power from the first pump and the optical pump power from the second pump are substantially orthogonal in polarization to one another.

16. The amplifier system of claim 14, further including:

a third optical pump and fourth optical pump optically coupled to the transmission fiber and receiving a DC electrical input and an AC electrical input from the controller, for

providing an optical pump power having a DC optical power component and an AC optical power component.

17. An amplifier system of claim 16, wherein a single oscillator sequentially controls the first, second, third, and fourth optical pump.

18. The amplifier system of claim 16, wherein the optical pump power provided by the third and fourth pumps are substantially orthogonal in polarization to one another.

19. The amplifier system of claim 16, wherein the optical pump power from the first and second pumps are at a first wavelength, and wherein the optical pump power from the third and fourth pumps are at a second wavelength that is different from the first wavelength.

20. The amplifier system of claim 19, wherein the optical pump powers provided by the first and second pumps are within the wavelength range of about 1400 nm to about 1510 nm.

21. The amplifier system of claim 19, wherein the optical signals amplified by said amplifier are within a wavelength range of about 1520 nm to about 1565 nm.

22. The amplifier system of claim 19, wherein the optical signal amplified by said amplifier system are within a wavelength range of about 1565 nm to about 1620 nm.

23. The amplifier system of claim 19, wherein the optical pump signals provided by the third and fourth pumps are within a wavelength range of about 1470 nm to about 1510 nm.

24. The amplifier system of claim 16, wherein the controller is adapted to determine the DC optical power component of the first, second, third and fourth pumps.

25. An amplifier system of claim 24, wherein each pump is controlled by a separate controller.

26. The amplifier system of claim 24, wherein at least one controller includes a plurality of controllers.

27. The amplifier system according to claim 26, wherein each controller of the plurality of controllers includes an oscillator, and wherein the modulation frequency of each of the oscillators is different from that of the other oscillators.

28. An optical communication system, comprising:

an optical fiber adapted for use as an optical waveguide amplifier;

at least one optical pump optically coupled to the optical fiber, the pump receiving both a DC electrical input and an AC electrical input, and providing an optical pump power to the optical fiber having both a DC optically power component and an AC optical power component;

an optical pump power detector optically coupled to the pump;

at least one controller coupled to the pump power detector to determine the DC optical power component of the optical pump power, for adjusting the DC electrical input to the pump based on the DC optical power component;

an optical transmitter optically coupled with the optical waveguide amplifier, wherein the optical transmitter is adapted to transmit an optical signal; and

an optical receiver optically coupled with the optical waveguide amplifier, wherein the optical receiver is adapted to receive the source signal.

29. A Raman fiber amplifier system, comprising:

an optical fiber adapted for use as a Raman optical waveguide amplifier;

at least one optical pump optically coupled to the optical fiber, the pump receiving both a DC electrical input and an AC electrical input, and providing an optical pump power to the optical fiber, the optical power pump having both a DC optical power component and an AC optical power component;

an optical pump power detector optically coupled to the pump; and

at least one controller operatively coupled to the pump power detector and adapted to determine the DC optical power component of the optical pump power, and wherein the controller adjusts the DC electrical input to the pump.

30. The amplifier system of claim 29, wherein the controller includes a comparing circuit that determines the DC optical power component of the optical pump power by comparing an electrical pump signal that is proportional to the optical pump power to the square of that electrical pump signal.

31. The amplifier system of claim 30, wherein the at least one pump includes a first pump and a second pump.

32. The amplifier system of claim 31, further including:

a third optical pump and fourth optical pump optically coupled to the transmission fiber and receiving a DC electrical input and an AC electrical input, and providing an optical pump signal having a DC optical power component and an AC optical power component.

33. The amplifier system of claim 32, wherein the optical pump power from the first and second pumps are at a first wavelength, and wherein the optical pump power from the third and fourth pumps are at a second wavelength that is different from the first wavelength.

34. The amplifier system of claim 33, wherein the controller is adapted to determine the DC optical power component of the first, second, third and fourth pumps.

35. The amplifier system of claim 29, wherein the optical fiber is an optical signal transmission fiber.

36. The amplifier system of claim 29, wherein the optical fiber is a dispersion compensating optical fiber.

37. An optical communication system, comprising:

an optical fiber adapted for use as a Raman optical waveguide amplifier;

at least one optical pump optically coupled to the optical fiber, the pump receiving both a DC electrical input and an AC electrical input, and providing an optical pump power having both a DC optical power component and an AC optical power component to the optical fiber;

an optical pump power detector optically coupled to the pump;

at least one controller operatively coupled to the pump power detector, and adapted to determine the DC optical power component of the optical pump power, and wherein the controller adjusts the DC electrical input to the pump;

an optical transmitter optically coupled with the optical waveguide amplifier, wherein the optical transmitter is adapted to transmit an optical source signal; and

an optical receiver optically coupled with the optical waveguide amplifier, wherein the optical receiver is adapted to receive the source signal.

38. A method for controlling an optical fiber amplifier system, comprising:

providing an optical fiber adapted for use as an optical waveguide amplifier;

generating an optical pump power with at least one optical pump for transmission along the optical fiber, by providing the optical pump with a DC electrical input and an AC electrical input, the optical pump power having a DC power component and an AC power component;

detecting the optical pump power with an optical pump power detector;

controlling the DC electrical input to the pump by utilizing a controller that is operatively connected to the pump power detector and that determines the DC pump power component of the optical pump power from the pump.

39. The method of claim 38, wherein the step of providing the optical fiber includes providing an optical signal transmission fiber.

40. The method of claim 38, wherein the step of providing the optical fiber includes providing a dispersion compensating fiber.

41. The method of claim 38, wherein the step of providing the optical fiber includes providing a Raman optical waveguide fiber.

42. The method of claim 38, wherein the step of controlling the DC pump power component of the optical pump power includes utilizing a comparing circuit to compare an electrical pump signal that is proportional to the optical pump power to the square of that electrical pump signal.

43. The method of claim 42, wherein the step of controlling the DC pump power component of the optical pump power includes mixing the electrical pump signal and the squared electrical pump signal with a mixing signal having the same frequency of modulation as the AC electrical input to the optical pump, thereby resulting in a mixed electrical signal and a squared, mixed electrical signal.

44. The method of claim 43, wherein the step at controlling the DC pump power component of the optical pump power includes subtracting the electrical pump signal from the squared, mixed electrical signal.

45. The method of claim 44 wherein the subtraction of the electrical pump signal step occurs after the electrical signal amplitude is detected by the amplitude detection circuit.

46. The method of claim 45, wherein the step of controlling the DC pump power component of the optical pump power includes dividing the difference between the electrical pump signal and the squared, mixed electrical signal by the mixed electrical signal.

47. The method of claim 46, wherein the step of controlling the DC pump power component of the optical pump power includes converting the optical pump power to the electrical pump signal via a photodiode.

48. The method of claim 47, wherein the step of controlling the DC pump power component of the optical pump power includes amplifying the electrical pump signal prior to mixing and squaring the electrical pump signal.

49. The method of claim 38, wherein the step of generating the optical pump power includes generating the optical pump power from a first optical pump and a second optical pump.

50. The method of claim 49, wherein the step of generating the optical pump power includes generating the optical pump power from the first and second optical pumps such that the optical pump power from the first and second optical pumps are substantially orthogonal in polarization to one another.

51. The method of claim 50, further including:

generating an optical pump power via a third optical pump and a fourth optical pump for transmission along the optical fiber by providing the third and fourth optical pumps with a DC electrical input component and an AC electrical input component, the optical pump power from the third and fourth optical pumps having a DC pump power component and an AC pump power component.

52. The method of claim 51, wherein the step of generating the optical pump power from the first and second pumps includes providing the optical pump power from the first and second pumps with a first wavelength and wherein the step of generating the optical pump power from the third and fourth pumps includes providing the optical pump power from the third and fourth pumps with a second wavelength that is different from the first wavelength.

53. The method of claim 52, wherein the step of generating the optical pump power from the first and second pumps includes providing the optical pump power from the first and second pumps within the wavelength range of from about 1400 nm to about 1510 nm.

54. The method of claim 53, wherein the step of generating the optical pump power from the third and fourth pumps includes providing the optical pump power from the third and fourth pumps within the wavelength range of from about 1470 nm to about 1510 nm.

55. The method of claim 51, wherein the step of controlling the DC electrical input to the pump includes controlling the DC electrical to the first, second, third and fourth pumps.

56. The method of claim 51, wherein the step of controlling the DC electrical input to the pump includes controlling the DC electrical input to the first, second, third, and fourth pumps with a plurality of controllers.